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THE GEORGIA ACADEMY OF SCIENCE

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PROGRAM NUMBER

TWENTY-FIFTH ANNUAL MEETING

OF

THE GEORGIA ACADEMY OF SCIENCE

MEIGS HALL, MOORE COLLEGE, TERRELL HALL
THE UNIVERSITY OF GEORGIA
ATHENS, GEORGIA

APRIL 9-10, 1948

PROGRAM

APRIL 9, 1948

9:00 Registration. Meigs Hall, Main Hall

9:00 Executive Council Meeting, Meigs Hall, Room 3

10:00 Symposium on Valence. Terrell Hall, Room 31
Dr. W. H. Jones, Presiding

12:30 Lunch

2:00 Business Meeting. Meigs Hall, Room 1

3:00 Reading of Papers
Section A. Meigs Hall, Room 1
Section B. Meigs Hall, Room 201

6:30 Academy Dinner, in honor of Past Presidents and Charter Members. Snelling Hall
Dr. Tomlinson Fort, Toastmaster

8:30 Address by Dr. Percy Bridgman of Harvard University
Nobel Prize Winner in Physics
Forestry Auditorium
Subject: A Survey of High Pressure Physics

APRIL 10, 1948

10:00 Reading of Papers
Section A. Meigs Hall, Room 1
Section B. Meigs Hall, Room 201

10:00 Meeting of theJunior Academy of Science
Physics Building, Room 201
Mr. W. W. Keller, Presiding

PAPERS

SECTION A

The Effect on the Blood of Rats of a Diet Deficient in Lysine

WALTER L. BLOOM, GEORGE T. LEWIS and JEAN CLARKSON,
Department of Biochemistry, Emory University, Georgia

Adult albino rats were maintained on two types of lysine-deficient diets. In one diet the protein was furnished by deaminized casein and in the other by rolled oats.

Blood was collected from the tails of the animals previous to placing them on the diet and at frequent intervals thereafter. The blood samples were used for red cell counts and hemoglobin determinations. Within a few days after the lysine-deficient diet was instituted, the hemoglobin level began to fall. Somewhat later the red cell count also began to decline. These trends could be promptly reversed by the injection of small amounts of lysine. The animals lost weight, particularly on the deaminized casein diet, but that the weight loss was not responsible for the findings was shown by restricting the caloric intake of normal animals. This partial starvation diet had very little effect on red cell count or hemoglobin level.

Implications of these findings in the problem of human anemias will be pointed out.

15 Min. Lantern slides.

Electrokinetic Studies on Malaria Infections

W. B. REDMOND, Biology Department, Emory University

The Electrophoresis cell designed by Abramson has been used to determine the electrokinetic charge on the surface of the blood cells of pigeons. This apparatus is used to calculate the charge by measuring the rate of movement of the cells in an applied electrical field.

Measurements of the electrophoretic mobilities of red blood cells of normal pigeons and of pigeons infected with malaria have revealed that the negative charge on the cells is reduced during and after the infection. The charge on the cells containing parasites is reduced still further. These cells are 25 to 30 per cent slower than the uninfected cells from the same bird. The reduction of the charge appears to be related to the immunity developed by the host to the host to the infection.

The charge was reduced to a similar extent on the cells of birds given atabrine, though no parasites were ever seen in blood smears. Atabrine also reduces the charge on cells in vitro. Other drugs are also being used.

15 Min. Lantern.

Locomotor Mechanics in Reptiles and Mammals

JOHN T. MANTER, Department of Anatomy, University of Georgia School of Medicine

A comparison is made of the mechanics of walking in two animals—the cat, as an example of a generalized mammal, and the alligator, as a representative reptile.

Motion pictures in side view show similarity in the posture of distal limb segments, and disparity in the proximal members. This is probably related to more drastic evolutionary modification of structures in the mammalian shoulder and hip than in the elbow and knee regions.

Accelerations of the centers of gravity are obtained from an analysis of photographs, while external forces delivered by the thrust of separate limbs are measured by force plates. By restricting the action of the limbs to a vertical fore and aft plane the mammal shows great reduction in the lateral component of thrust and acceleraiton.

Oscillations in forward and vertical components of velocity are retained and are associated with the strokes of the limbs. Some of the energy used to raise the center of gravity can be recovered in propulsion. By directing their propulsive forces straight ahead rather than obliquely, mammals are better able to take such advantage of gravitational force.

15 Min. Lantern slides.

The Conversion of DL-threonine and DL-allothreonine to Glucose in the Phloridnized Dog and Rat

W. KNOWLTON HALL, Department of Biochemistry, University of Georgia School of Medicine, Augusta, Ga.

DL-threonine and DL-allothreonine were synthesized by the method of Carter and West (Organic Syntheses 20: 101 (1940). In 5 phloridzinized dogs excretion of "extra glucose" was determined by comparison of excretion of glucose on a day when the amino acid was administered with preceding and following control days. Five dogs were used and 10-15 grams of DL-threonine were administered 6 times and 15-22 grams of DL-threonine 4 times. In every instance "extra glucose" was excreted.

The excretion of glucose by phloridzinized rats was determined after the administration of 0.5 or 1.0 gram of DL-threonine or 0.5, 1.0, or 1.5 grams of DL-allothreonine. This was compared with the glucose excretion of control rats. "Extra glucose" was excreted by the rats given the larger doses of each amino acids. Thus in the phloridzinized dog and rat, both DL-threonine and DL-allothreonine are converted to glucose, although the DL-allothreonine was not as effective in the formation of glucose as was the DL-threonine.

10 Min. Lantern slides.

Studies on Myanesin: Rate of Disappearance From the Blood and Tissues of 3—(Orthotoloxyl)-1, 2—Propanediol (Myanesin)

JAMES L. MORRISON, ARTHUR P. RICHARDSON and HARRY A. WALKER, Department of Pharmacology, Emory University School of Medicine.

Myanesin (3-(orthotoloxyl)-1, 2-propanediol) blood levels were followed until disappearance from the blood of an intravenous priming dose of 60 mgm./kgm. using the diazotization method of Titus, Ulick and Richardson (J. Pharmacol. and Exp. Ther. (in press). The same dogs were used again, where possible and after a suitable interval, for intravenous infusion with myanesin at the rate of 1 mgm./kgm./min. for two hours. Later this was repeated using an infusion rate of 2 mgm./kmg./min. Blood vessels were determined at intervals during infusion and until the drug disappeared from the blood streams on cessation of the infusion. Infusion was through a cannula in the femoral vein. Samples of blood were taken from the jugular vein. Certain animals were sacrificed following the last infusion by injection of air. Organs were removed and myanesin content was determined.

Myanesin concentration appears to be much higher in brain, pancreas, kidney, spleen and only slightly higher than plasma in muscle, lung and liver. Concentration of myanesin in spinal fluid and saliva was slightly lower than in plasma.

Blood level curves were obtained which indicate that doses of myanesin as high as 60 mgm./kgm. can be disposed of by the body in a period of 30-60 minutes. By infusion with myanesin after a dose of 60 mgm./kgm. an infusion rate can be estimated which will maintain a constant level in blood. Since infusion rates of 1 mgm./kgm./min. will not maintain a constant level and rates of 2 mgm./kgm./min. leads to accumulation of myanesin the maintenance level must lie somewhere between.

15 Min. Lantern.

The Basal Metabolic Rate of Georgia Medical Students

PHILIP DOW and ROBERT H. SHULER, University of Georgia School of Medicine

Records have been kept of the basal metabolic rate determinations of the last ten sophomore medical classes (500 technically acceptable charts). Procedures were carried out by the students on each other; techniques were supervised by the Physiology teaching staff, and all records and calculations have been checked by the authors. A period of eight years is covered, including samples of all months but March.

Class means range from 8.2 to 13.5 per cent below the 1936 Mayo standards, with the general average at -10.2. The females, though few, have a significantly higher average (-2.6). Correlations of BMR with age, size, specific stature, and scholastic achievement show complete absence of association. Statistically signifi-

cant differences between class means have not been satisfactorily explained.

These results should emphasize the indispensability of adequate local controls in the interpretation of basal metabolic rate tests in medical laboratories.

18 Min. Standard lantern slides.

Effects of Continuous Centrifugal Forces on the Developing Tadpole

STEPHEN W. GRAY and REBECCA G. WEBB, Anatomy Department, Emory University Medical School
(Introduced by Trawick Stubbs)

In an effort to determine the effects of low, but long continued gravitational forces, developing eggs of **Bufo sp.** were centrifuged for periods up to ten days at forces from one to six times that of gravity. Centrifugation commenced at the yolk-plug stage of the egg. Animals centrifuged for ten days at six times gravity exhibited abnormal swimming habits. They swam downward persistently and endeavored to bore their way through the bottom of the container. They returned to the normal pattern of swimming to the top when stimulated after having been removed from the centrifuge for two to three days. This is noteworthy in that they had never before experienced normal gravity in their swimming career.

The morphology of the vestibular apparatus was studied by means of serial reconstruction in wax to determine if there was a visible disturbance. No changes in form or orientation of the developing otic vesicle were found. It is difficult, in fact to be convinced that the vestibular apparatus exercises much control over the behavior of the tadpole although Wang and Lu reported loss of orientation in tadpoles following ablation of the labyrinth. Further studies in normal orientation will be required.

10 Min.

Medical Genetics and Preventive Medicine

GEORGE P. CHILD, Department of Pharmacology, University of Georgia School of Medicine, Augusta

Our knowledge of human genetics has now reached the stage where definite practical applications to medicine are available and in use. Then include medico-legal problems, genetic prognosis, diagnosis and preventive medicine.

In forensic medicine, there are over 800 blood types to which man may belong and in many states these data are accepted as legal evidence in the establishment of non-paternity.

The physician is often called upon to inform prospective parents of the probability of some particular genetic trait being transmitted to their offspring.

Very often diagnoses may be made earlier by an examination of the genetic background of a patient.

In preventive medicine, genetics is showing an ever increasing application. It is now becoming possible to prevent or delay the onset of particular deleterious genetic characters. When a patient who has a definite inherited disease or diathesis presents himself, the examination and treatment should not stop there. If suitable clinical or laboratory tests are available the relatives of the affected patient should be studied to determine whether they have inherited the character. In many instances it has been possible to determine such inheritance and institute suitable preventive measures. The applications of medical genetics to various disease e.g. glandular, cardiovascular, blood dyschasias, cancer, etc., will be illustrated with specific cases.

15 Min. Lantern slides.

Comparison of the Fick and Dye Injection Methods Measuring the Output of the Human Heart

W. F. HAMILTON, Department of Physiology, University of Georgia School of Medicine, Augusta

This is a report on a cooperative research undertaken by members of the Department of Medicine, Columbia University and the Department of Physiology at the University of Georgia School of Medicine. About twenty experiments were made in Georgia and thirty in New York. Eleven investigators cooperated.

An outline of the methods will be given together with the results of the comparison and the advantages and disadvantages of each method.

15 Min. Lantern slides.

Report on Surveys of Hemoglobin Levels of Groups in Sections of Georgia

WILLIAM R. BROWN, Departments of Anatomy and Biochemistry, Emory University

This report is a presentation of hemoglobin levels of more than two thousand school children in both north and south Georgia, and of nine hundred individuals of all ages in the Atlanta area. These data will be analyzed and discussed.

15 Min. Projector for 3 1/4 x 4 slides.

Studies on Rutin, A Vitamin P Substance

EVANGELINE PAPAGEORGE, FOSTER ADAIR, G. L. MITCHELL and ALICE RAYLE, Department of Biochemistry, Emory University School of Medicine

Rutin, the rhamnoglucoside of the flavonol quercetin, has vitamin P activity. Administration of rutin to normal subjects on low and on adequate ascorbic acid intakes produced no detectable effect on the level of blood constituents which may be expected to influence

membrane permeability, namely: calcium, potassium, sodium and cholesterol. Indication of a possible sparing influence on plasma ascorbic acid while on low C diet was not confirmed in animal experiments in which guinea pigs were fed rutin while on controlled ascorbic acid intakes. Furthermore, no effect of rutin on liver ascorbic acid, liver cholesterol or adrenal cholesterol was observed in the guinea pigs. The one significant finding was an increase in adrenal ascorbic acid concentration of the rutin-fed animals maintained on adequate C levels.

In vitro studies in the Warburg respirometer confirmed the reported anti-oxidant effect of rutin and of ascorbic acid toward epinephrine. Furthermore, rutin plus ascorbic acid retarded the auto-oxidation of adrenalin much more markedly than either of these alone.

Our findings support the hypothesis that vitamin P activity involves an **in vivo** effect on epinephrine and also indicate the possibility that this effect may be mediated through ascorbic acid.

15 Min. Lantern slides.

The Interaction of Ephedrine and Tetraethylammonium

RAYMOND P. AHLQUIST, Department of Pharmacology, University of Georgia School of Medicine, Augusta

Ephedrine, a sympathomimetic amine, has pharmacological effects similar to those of epinephrine (adrenaline). One of the theories as to the mechanism of action of ephedrine postulates that it acts by protecting naturally occuring adrenaline from destruction by the enzyme amine oxidase. This paper reports the results of experiments on the arterial blood pressure and flow of anesthetized dogs which show that in the presence of tetraethylammonium, a substance which inhibits the formation of adrenaline, ephedrine still has its characteristic actions. This indicates that since ephedrine is still active in the absence of adrenaline it cannot be producing its action by protection of the adrenaline.

10 Min. Lantern.

An Analysis of Therapeutic Techniques Used for 44 Clinical Cases

FLORENE M. YOUNG, Department of Psychology, University of Georgia

Clinical psychologists disagree as to the methods which should be employed in psycho-therapy. Proponents of Carl Rogers emphasize non-directive procedures, while those of opposing schools believe that direction and planning are basically the function of the therapist, who is in the dominant role.

During the school year of 1946-47, 24 cases were interviewed, using the latter approach in modified form. During the current year of 1947-48, definite conscious effort has been made to follow the non-directive therapeutic techniques in interviews with 20

students, for a minimum of five sessions for each case. If the subject failed to make desirable progress within that period of time some of the procedures of the direct approach were instituted.

A comparison of the results of the two approaches is attempted in the present paper. The outcomes vary somewhat according to the following factors: sex, intelligence, type and duration of maladjustment, and the number of positive or favorable elements in the student's life. The evidence seems to favor the direct approach, for the improvement of these subjects was more rapid and more clearly observable. However, the relatively small number of cases involved makes it possible to state only tentative conclusions.

15 Min.

Observations on Social Behavior Among Dogs

W. T. JAMES, Department of Psychology, University of Georgia

In previous experiments it has been shown that in most litters of puppies a dominance-submissive order develops. The dogs fall in general into three classes: extremely dominant animals; extremely submissive, and an intermediate group, which are well balanced and which get along well together.

The present report deals with the observations of the development of the dominance-submissive order in a litter of puppies, beginning at a little over two months of age and continuing until maturity. In this litter all three types were found. The dominance difference was evident from the time of the first observation, but there was a shift in the position of one dog after 115 days, from the intermediate group to the dominant dog of the litter. The submissive animal has retained his status from the beginning.

An effort was made to raise the aggressive nature of the extremely submissive animal by small doses of alcohol, with some success.

15 Min. Slides.

Handedness and Involuntary Movement

A. S. EDWARDS, Department of Psychology, University of Georgia

Large differences in handedness are known to exist in connection with voluntary activities as found in skilled movements, in writing and in other delicate operations. Does any such difference appear in involuntary movements? Finger tremor is beyond the control of the individual and was chosen as a kind of involuntary movement which might be compared with hand movements which revealed handedness. Eliminating all doubtful subjects, definitely right-and-left-handed individuals were measured with the finger tronometer for differences in the finger tremor of the two hands. In 100 cases, 50 right and 50 left handed subjects, no statistically significant differences were found.

8 Min.

The Relative Importance of Air, Steam, and Carbon Dioxide As Leavening Gases in Cakes Made With Different Types of Fat

MAUDE PYE HOOD, Associate Professor, Home Economics, University of Georgia, Athens

The relative increase in cake volume over batter volume, attributable to each of the three gases, air, steam, and carbon dioxide was determined. Three fats of different consistencies, oil, butter, and hydrogenated lard, were used. Specific gravity, viscosity, and the electrical conductivity of the batters as well as cake volume were determined. Cakes were rated for palatability.

Major increase in cake volume was produced by carbon dioxide, followed by steam and air, in order given. Percentage increase attributed to any of the three gases varied with the type of fat used.

The effectiveness of steam in the presence of air in leavening the cakes varied with the type of fat used, being greatest with oil, intermediate with butter, and least with hydrogenated lard. Air-evacuated batters showed very little increase in cake volume, indicating that effectiveness of steam as a leavening agent was influenced by the presence and distribution of air bubbles in the batter.

Cakes from air-evacuated batters were rated unpalatable. Ratings for cakes leavened by air-steam and by carbon dioxide-air-steam were much higher and were very similar for the two groups of cakes.

Section B

SYMPOSIUM ON VALENCE

Dr. William H. Eberhardt, Georgia School of Technology
Dr. Osborne R. Quayle, Emory University
Dr. Harold B. Friedman, Zep Manufacturing Company
Dr. E. Earl Royals, Emory University
Dr. Thomas H. Whitehead, University of Georgia

Basic Principles of the Modern Concept of Valence

W. H. EBERHARDT, Georgia School of Technology

The introduction of wave mechanics in 1926 and its immediate and vigorous application to chemical problems resulted in two major contributions to the concept of valence, namely a more satisfactory description of the atom itself, and the concept of resonance. The concept of resonance is essentially a method of approximation in which a molecular system is thought of as a mixture of many extreme structures, combined to give the greatest stability to the actual system. The properies of the actual system are not those of any one of the extreme structures, but depend on all of the contributing structures. An application to the electron-pair bond and the hydrogen molecule exemplifies the concept.

20 Min. Blackboard.

Coordinate Covalency in Organic Compounds

O. R. QUAYLE, Emory University

The concept of the coordinate covalent linkage was born of theoretical necessity, being suggested by M. L. Huggins in 1919. In a normal covalent linkage each atom involved supplies one electron. In a coordinate linkage one atom, the donor, supplies two electrons; the other, the acceptor none. Supporting evidence for the existence of such a linkage has been found in dipole moments and particularly in parachor determinations. Such linkages are relatively common, occuring in nitro compounds and in sulfonic acids. Of particular interest are the amine oxides, the optical isomerism of the sulfinic esters and the stereo isomerism of the disulfoxide of dithiane.

A special case of essentially the same phenomena produces the "hydrogen bond" or "hydrogen bridge," and chelation. Strong chemical evidence exists for this "different" hydrogen bond in the greatly increased basicity of quaternary bases, in certain polymerizations, etc. Infrared absorption, X-ray, and electron diffraction studies, as well as solubility and parachor determinations, all give evidence supporting the reality of the hydrogen bridge.

20 Min. Lantern slides.

The Ionic Chemical Bond

HAROLD B. FRIEDMAN, Zep Manufacturing Company

The electronic theory of valency possesses advantages over the classical theory in that it is able to distinguish between two kinds of mechanisms by which atoms may be united, the electrovalent and the covalent bonds. The electrovalent or ionic bond is discussed with reference to its nature and properties and the significance of the concept. Examples will be given, together with some consideration of wave mechanical theory.

20 Min. Blackboard and lantern slides.

Resonance Interpretation of Organic Reaction Mechanisms

E. EARL ROYALS, Emory University

Since the discovery of the electron and the interpretation of the covalent bond as a shared electron pair, numerous attempts have been made by organic chemists to explain the behavior of organic substances in terms of their electronic structures. These attempts have culminated in a body of theory which interprets organic reaction mechanisms in terms of two electronic effects, one a so-called inductive effect, and the other an electromeric or resonance effect. The inductive effect is characteristic of covalent structures in which two atoms of different electronegativities are linked together, and results in a closer attachment of the electron pair to the atom of higher electronegativity. The electromeric effect is characteristic of atomic groupings containing multiple bonds or unshared electrons or both. It results in an actual transfer to

greater or lesser degree of electrons from the orbit of one atom to that of another. Many organic reactions, such as aliphatic substitution, aromatic substitution, addition reactions of olefins, hydrolysis, and other processes, have been satisfactorily interpreted in terms of electronic effects. The case of aromatic substitution will be considered in some detail.

20 Min. Blackboard.

Some Special Problems in Valence

T. H. WHITEHEAD, Department of Chemistry, University of Georgia

No theory, or theories, of valence has been able to explain all types of chemical compounds. Modern theories of atomic structure have had some success in explaining the majority of chemical compounds in terms of ionic bonds, covalent bonds, and coordinate bonds. However, there are still many classes of compounds which cannot be explained in terms of the above concepts.

Among these are:

1. The Intermetallic Compounds
2. The Interstitial Compounds
3. The Metallic Carbonyls and Substituted Carbonyls
4. The Compounds of Boron

In lieu of adequate theoretical explanations, there are certain rules which have a sound experimental basis and are quite helpful in correlating the behavior of many of the above cases.

a) The Hume-Rothery Rule for intermetallic compounds
b) The Effective Atomic Number Rule for Metallic Carbonyls
c) The Isoelectronic Principle
d) The Hydrogen Bridge

The application of each rule will be made to the compounds for which it is applicable and its limitations stated. The failure of classical theories to explain these compounds will be pointed out.

A summation of our present knowledge of valence will be attempted with emphasis on its usefulness, its limitations, and its future.

15 Min.

Certain Factors Influencing Thermal Diffusion in Liquids

CHARLES B. VAIL and WILLIAM H. JONES,
Emory University

Thermal diffusion is the process wherein a fluid mixture, when subjected to a considerable temperature gradient, shows selective migration of its components, so that a degree of segregation results within the mixture. This behavior may be shown by gaseous or liquid mixtures. The mechanism is not fully understood, and the theory of thermal diffusion is particularly obscure with respect to liquids. The purpose of the work here reported was to test the effect of various factors on the extent of separation yielded by the latter process. The factors investigated included temperature difference, time, angle of inclination, and certain points of apparatus design. Though not a comprehensive study, the experiments performed do lead to certain conclusions which will be summarized in the report to be given.

15 Min. Lantern slides.

The Apparent Fluidity of Dispersions of Cellulose Fibers in Cupriethylenediamine

JANE FOSTER MARTIN and HOWARD M. WADDLE, Chemical Department, Research Division, West Point Manufacturing Co., Shawmut, Alabama

The process of bleaching and kier boiling is used to remove the extraneous material from cotton. These processes degrade to a varying extent the cellulose contained in the fiber.

An accepted method of measuring the extent of degradation of cellulose is to measure the fluidity of a dispersion of cellulose in cuprammonia. Due to inherent difficulties in working with cuprammonia, a method involving the cupriethylenediamine was developed and adopted in our laboratory. It was found that a dispersion containing 0.35 grams of purified cellulose per 100 grams of 0.25M cupriethylendiamine gave fluidities comparable with the A.S.T.M. cuprammonia procedure. By use of cupriethylenediamine it is more convenient to measure the degrading action of acids on cellulose.

The procedure can be used as a method of analysis for mixtures of viscose and cotton.

15 Min. Lantern for slides 3¼" x 4".

Synthetic Detergents: A Review

EDWARD G. ZACHERT, Zep Manufacturing Company, Atlanta, Ga.

The sovereignty of soap in the field of surface activity, especially detergency, has been sharply challenged in the past decade. A group of compounds, known as synthetic surface active agents, is being offered commercially to fill the individual needs of the many diverse types of industries. The compositions and characteristic actions of these compounds are classified to give an overall picture. Their uses in industry are discussed with particular attention to detergency.

15 Min.

Modern Wax Technology: A Review

HUBERT W. JENKINS, Zep Manufacturing Company, Atlanta, Ga.

In industry, the most commonly used waxes are: carnauba, paraffin, beeswax, candelilla, ozokerite, ceresin, and montan. Their uses date back to prerecorded history. Their occurrence in nature is described, and they are classified according to 1) their origin, and 2) their possible uses. The properties of certain newly found natural waxes are given, along with the description of certain useful synthetic waxes or wax replacements.

15 Min.

Chemical Research Resources in Georgia and South Carolina

J. SAM GUY, Emory University

At the suggestion of the Office of Naval Research, a survey was recently made of the research possibilities within the states of Georgia and South Carolina. This survey was carried out primarily in order to ascertain the potential research capacity available in these states. A set of twenty-five questions was submitted to most of the schools and colleges within this area and hte results of the questionnaire summarized. The general opinion is that both administration and chemists are anxious and willing to undertake basic research, and that an impressive total of time, space and trained personnel is at hand. However, most schools would need financial assistance in undertaking a research program of any considerable dimensions. This assistance could properly come from state or federal sources, since such a program would benefit both the region and the nation. This benefit would derive not only from the scientific results obtained, but even more, in time of national emergency, from the immediate availability of research facilities and trained research workers. This paper will attempt to bring out what our states are now doing, what they could do if properly subsidized, and what the results of such a program might well be.

15 Min.

The Magnetic Susceptibility of Cobalt Chloride in Enthanol-Water Solutions

F. S. WILSON and W. H. EBERHARDT, Georgia School of Technology

Details are presented of a simple and inexpensive Guoy-type magnetic balance of limited sensitivity using a permanent Alnico magnet. The susceptibility of cobalt chloride in solutions of ethanol and water was determined in an attempt to establish a correlation between the magnetic susceptibility and color of the solutions. No correlation was obtained. The data indicate that the change in color is not associated with a major change in bond character.

15 Min.

Further Studies in the Mechanism of the Gram Stain

HERMAN BAKER and WALTER L. BLOOM, Department of Biochemistry, Emory University, Georgia

The mechanism of the Gram stain has been studied by several investigators. It is thought that the Gram positive stain of bacteria is produced by a dye and the magnesium salt of ribonucleic acid. This report will deal with changes in the staining characteristics of Gram negative bacteria using desoxyribonucleic acid alone and in combination with a basic polypeptide. The results reported indicate that desoxyribonucleic acid can act with the bacterial cell to bring about a positive reaction in the Gram stain.

15 Min. Lantern slides.

Applications of Conservation Agronomy to Good Land Use

WILLIAM E. ADAMS, Southern Piedmont Conservation Experiment Station, Watkinsville, Ga.

The causes of erosion are briefly discussed and their effect on the soil, plants, and animals together with some of the applications of conservation agronomy to the four classes of cropland.

Experimental results, illustrated by five charts, indicate that it is possible to reduce erosion, improve the soil, and increase the yields of cotton, corn, and peanuts by growing these crops in good soil-improving and soil conserving rotations. Emphasis is placed on leguminous close-growing cover crops as a base for crop rotations. These covers protect the land against erosion and supply nitrogenous residues and organic matter to the soil. This practice makes the soil more fertile, more mellow and absorptive, less erodible, and easier to manage.

The study, begun in 1943, reports the results with 29 cropping systems, including 5 with cotton, 4 with corn, and 3 with peanuts which are reported in detail. The experimental plots are in triplicate. The adjustment of various conservation-type crop rotations and cropping practices to specific land classes is the principal object of the study. The treatments included uniform applications of lime, recommended rates and analyses of fertilizers, and their proper placement; good seed of adapted varieties, proper cultural practices and disease and insect control.

The results reported in this paper apply principally to Land Class III, the predominating class of land in the Piedmont section of Georgia and the southeast.

15 Min.

Boron as a Plant Food in Georgia

L. C. OLSON, Associate Agronomist, Georgia Experiment Station

Some of the twenty physiological disorders in plants caused by a deficiency of boron are described. Results of field experiments conducted over a period of ten years on many different soil types in Georgia indicate an application of 5 to 20 pounds borax per acre is suitable in most cases. In one case, 5 pounds per acre was toxic. Borax has proven especially beneficial to legumes such as alfalfa and the clovers. Cotton has not responded consistently to applications of borax, although where borax was applied the boron content of the foliage was considerably increased.

A survey made of the boron content of the soils in the state showed that the water-soluble boron ranged from .05 to .55 parts per million in the surface six inches and the total boron from 5 to 52. The water-soluble fraction appears to be a good index of the plant's needs for boron. Difficulties encountered in the analysis for boron are discussed, as well as difficulties encountered in its use as a fertilizer.

15 Min. Projector for 2x2 slides.

Hybrid Corn

G. A. LEBEDEFF, Georgia Agricultural Experiment Station

The history of corn development in the United States from Pilgrim days up to the present is briefly described. Indians and early settlers practiced a certain amount of selection of the desired individual ears of corn from the main crop. Thus numbers of strains of corn were developed which were adapted to certain environments. Although the existence of sex in plants was known since about 1700, controlled hybridization between strains of corn has been in practice only since about 1850. When this was accompanied by selection, some improvement in yield and other desirable characteristics were accomplished. The main improvement in yield came at that time from the use of better cultural practices. Since about 1890 breeders emphasized selection of strains of corn which are high yielding and free from diseases, and in this way the present varieties of corn were developed, which are more uniform and better resistant to prevalent diseases. The most significant improvement came with the development of hybrid corn. In this development the best standard varieties were inbred for several generations. Though inbreeding resulted in marked decrease in vigor and productivity, the inbred lines were selected for many desirable traits such as good root system, stiff stalk, and resistance to insect injury and diseases. When these elected inbred lines were crossed, the vigor and yield were not only restored, but surpassed that of the best varieties. The growth of the corn acreage was most remarkable. Only a few acres were planted to hybrid seed in 1928. By 1933, 37,000 acres were planted to hybrid corn. In 1937 the hybrid corn acreage reached the 4,000,000 mark. In 1947, 62 million acres were planted to hybrid seed, which is 71 per cent of the total corn acreage. In Georgia only 2.5 per cent of the corn acreage was planted to hybrid seed in 1947. The hybrid corn breeding project was started in this station in 1943, and the progress made in the development of hybrids suitable for Georgia's conditions is briefly described.

15 Min.

Cold Storage of Peanuts and Peanut Products

DR. J. G. WOODROOF and HELEN H. THOMPSON, Georgia Experiment Station

The production of peanuts has more than doubled in recent years, until it is now more than 1,600 million pounds, which is about eight times the total production of almonds, filberts, pecans, and walnuts. There are 1,000 million pounds shelled for the edible trade annually, almost half of which go into peanut butter, and the remainder are salted or used in candies or bakery products.

To maintain a year-round supply for these purposes peanuts must be stored for periods of one year or more. In common storage they are especially susceptable to insect and rodent infestation, discoloration, staleness, rancidity and sometimes to molding. In fact, shelled peanuts (and 97% of them are shelled before being cold stored) cannot be successfully held through the summer

months without a great deal of fumigation or cold storage.

Experiments have shown that under the proper temperature, humidity and pure air conditions shelled peanuts can be successfully held for as long as two years. It is a definite means of keeping out insects and rodents, preventing discoloration, retarding staleness and rancidity, and of keeping the peanuts fresh. For proper storage of peanuts the temperature should be held constantly at from 34 to 32°F., the relative humidity should be held to 75 per cent or lower, a means of keeping the air free of odors, should be provided. Cold stored peanuts are damaged greatly by the absorption of moisture or odors from other products. The 45 per cent oil in peanuts has such affinity for odors and flavors that once they are absorbed no practical means has been found for removing them.

15 Min. Lantern for 4x3¼ slides.

Effect of Little-Leaf Disease on Anatomy of Shortleaf Pine

L. W. R. JACKSON, George Foster Peabody School of Forestry

Symptoms of little-leaf disease of shortleaf pine (**Pinus echinata** Mill.) are characterized by a gradual annual reduction of growth of the branch shoot elements and the deterioration of the roots. An investigation of the cause of the disease required an anatomical study of the root and shoot parts. Data on shoot growth are based on microscopic measurements of transverse sections of 1-to-6-year-old branch internodes of 15 healthy, and 15 diseased trees. There was no observable difference in the condition or type of mycorrhizae formed on diseased and healthy trees. Shortleaf pine has coralloid ectotrophic mycorrhizae. Roots of diseased trees exhibit excessive and premature formation of rough bark called brown patch, which is caused by the cork cambium cutting deep into the phloem. The reserve food storage capacity of root bark phloem is greatly reduced by brown patch. The radical thickness and the cell size of the primary cortex and the secondary phloem of branch shoots of affected trees is drastically reduced as the disease progresses. The bulk of the phloem parenchyma cells of branch phloem become necrotic during the second year after their formation, giving the tissue a reddish tinge. Pith diameter of branch shoots is greatly reduced. There were no internal malformations caused by pathogenic organisms.

15 Min. 35 mm slide projector and screen.

Imaginary Graphs of Elementary Real Functions for Excluded Portions of the X-Axis

JAMES A. WARD, University of Georgia

Let the X-axis, the Y_r-axis and the Y_i-axis be three mutually perpendicular axes in space. We plot real values of y along the Y_r-axis and imaginary values of y along the Y_i-axis. We restrict x

to be real. The real graph of the real function $f(x,y) = 0$ will lie in the XY$_r$ -plane.

Real values of x that give pure imaginary values of y now give points in the XY$_i$ -plane. For example $x^2 - y^2 = 1$ is an hyperbola in the XY$_r$ -plane and a circle in the XY$_i$ -plane. Mr. Ward showed the imaginary parts of several elementary functions that are generated by "excluded" values of x.

15 Min.

Truncated Normal Frequency Distributions

A. C. COHEN, JR., Associate Professor of Mathematics,
University of Georgia

Karl Pearson and Alice Lee presented a method in 1911 for determining parameters of complete normal frequency distributions when data were available for only a truncated portion of the distribution. R. A. Fisher in 1931 presented an equivalent method for dealing with this same problem. Both the Pearson-Lee and the Fisher methods required special tables of functions of the data for their successful application to practical situations. In the present paper, some of the problems connected with the two methods are discussed and it is shown that not only are the two methods equivalent in the sense that they lead to identical results, but a simple linear relation between the two sets of functions tabled for use in connection with the respective solutions is determined.

15 Min.

Monotonic Series

TOMLINSON FORT

An infinite series, $a_1 + a_2 + a_3 + \cdots$ is said to be monotonic if $a_n = a_{n+1}$ 0. Such series have been extensively studied and constitute one of the most important classes of series. If any infinite series converges it is necessary that a_n approach zero, however, in the case of a monotonic series not only a_n but na_n approaches zero. This is not true of all series as is readily shown by examples. There are a number of other properties of monotonic series that are not common to all series.

The present paper generalizes the idea "monotonic" in such a way as to include a great many series other than monotonic series which nevertheless possess the most important properties of monotonic series. Generalizations are both in the domain of real numbers and in the domain of complex numbers.

Industrial Mineral Developments of Georgia

GARLAND PEYTON, State Geologist, Atlanta, Georgia

The variety of minerals produced in Georgia is greater than in most states of the Union, although the lack of coal, oil, and iron ore has caused Georgia to rank low in mineral wealth. Nevertheless, the development of many non-metallic and industrial minerals is bring Georgia into the limelight as a producer of such essential raw materials as kaolin, fuller's earth, barite, ocher, dimension stone, kyanite, and sillimanite.

15 Min.

A New Classifications of the Clays of Georgia

DR. LANE MITCHELL, Head, Department of Ceramic Engineering, Georgia Tech

Heretofore, clays have been classified by geologists, mineralogists, and ceramists according to the method of geological formation without particular emphasis being placed upon the mineral nature of the clay. A new classification proposes that clays be classified according to mineral nature without regard to the method of formation. Such a classification would group together the primary kaolins of North Georgia, the red alluvial river bank clays, the red residual clays of the central upland, and the sedimentary kaolins of the fall line. The Ordovician bentonites of northwest Georgia, the bleaching clays of middle Georgia and the fuller's earth of southwest Georgia, would be grouped together, and the shales of northwest Georgia would be grouped with the Brevard schist clays of the Piedmont region.

10 Min.

The Work of a Railroad Geologist

(An interpretation of the geology of our mineral resources translated into dollars and cents.)

POOLE MAYNARD, Ph.D., Industrial Geologist, Atlantic Coast Line Railroad Company

The geologist must have the advantage of the broadest fundamental training in inorganic chemistry and in all branches of the science of geology, such as paleontology; economic geology; mineralogy, chrystalography; geological physics and petrography and historical geology to enable him to cope with the progress of the technology necessary to apply to interpret products that can be prepared and utilized in industry.

The physical and chemical requirements of the trades and the changes in raw material requirements are equally as important.

Examples of industrial development dependent upon pure science and its commercial interpretation will be given.

15 Min.

The Mineralogy of Indian Artifacts in Georgia

A. S. FURCRON, Assistant State Geologist, Atlanta 3, Ga.

Indian artifacts are identified from the three large geological provinces of the State (area of Crystalline rocks, Paleozoic area of northwest Georgia, and Atlantic Coastal Plain). In some cases they can be traced to definite localities. Projectiles and cutting tools were made of varieties of quartz, large implements, of sandstone, quartzite, "diorite" (partly altered ultra-basics), Triassic diabase, and limestone; pots and pipes of "soapstone" and baked clay. Cryptocrystalline varieties of quartz from the Paleozoic area were most highly prized for arrowheads, thus were used extensively by Indians from the Crystalline area where the best material for similar artifacts consists of dense varieties of vein quartz. Coastal Plain Indians used cherts from the Tertiary formations, but borrowed vein quartz from the Crystalline area. Sources of stone materials for pots represent localities in the Crystalline area where ultra-basic rocks have been altered to talc-amphibole-chlorite masses, and these localities will be named.

A brief general classificaiton of materials is as follows:

Crystalline rocks: dense, milky vein quartz, rock crystal, diorite, "soapstone," diabase, hornblende gneiss, granite.

Paleozoic area: at least eight cryptocrystalline varieties of quartz, fine-grained sandstone, Weisner quartsite, limestone.

Coastal Plain: cherts.

The value of recording accurately location of artifacts and their proper mineralogical identification is stressed.

15 Min. Place to display geological map of Georgia, 42x36".

A Report of Helminthosporium Species on Gramineae in Georgia

JULIAN H. MILLER, Department of Plant Pathology, University of Georgia

Last year, with the assistance of various agricultural workers and farmers, we made a survey of *Helminthosporium* species parasitizing certain members of the grass family. Most of the effort was concentrated on oats, because of the widespread interest in the introduction of a new species, *H. victoriae*. The hosts and the *Helminthosporium* species found on them follow in the table.

1. *Avena sativa* L.
   H. Avenae Eidam
   H. sativum P. K. B.
   H. victoriae Murph.
2. *Cynodon Dactylon* L.
   H. giganteum H. & W.
   H. Cynodontis Marig.
3. *Festuca elatior* L.
   H. dictyoides Drech.?
4. *Eleusine indica* DC.
   H. leucostylum Drech.
5. *Holcus halepensis* L.
   H. Sorghi Cke.
   H. turcicum Pass.
6. *Holcus Sorghum* L.
   H. Sorghi Cke.
   H. turcicum Pass.
7. *Hordeum vulgare* L.
   H. gramineau Rab.
   H. sativum P. K. B.
   H. teres Sacc.

8. *Sporobolus indicus* (L) R.Br. H. Ravenelii Curt.
9. *Triticum aestivum* L. H. sativum P. K. B.
10. *Zea Mays* L. H. Maydis Nisik. & Mke. H. turcicum Pass.

Incidence and distribution facts as well as notes on parasitism were recorded.

15 Min.

Watermelon Seed Treatments – Preliminary Report

GEORGE E. THOMPSON, Department of Plant Pathology, University of Georgia, Athens, Ga.

Watermelon seeds of the variety Tom Watson were treated with excessive amounts of 10 different dust fungicides. The excess dust was removed by rolling the seeds over wire screening. These dusts were compared with seeds treated in mercuric chloride 1-1000 for 10 minutes followed by washing in running water for 20 minutes and untreated seeds.

Seeds from each treatment and untreated were plated out on potato dextrose agar. It was found that the different treatments varied in their effort on seed germination and killing of seed borne organisms.

Seeds from each treatment were planted in pots with two types of unsterilized soil (1) a mixture of a loamy garden soil and sand, 1-1 and (2) sand alone. Each treatment consisted of 5 randomized 6 inch pots with 25 seeds in each pot. After planting and covering the seeds, the soil was inoculated with 50 ml. of a conidal suspension of the fungus, *Glomerella lagenarium* (Pass.) Stevens (*Colletotrichum lagenarium* (pass.) Ellis & Hals.). The results showed that seeds treated with Arasan, Phygon, Spergon and Yellow Cuprocide produced significantly more plants than the untreated (soil uninoculated) and check and also significantly more plants than any of the other treatments when grown in the sand-soil mixture. None of the treatments produced significantly more plants than the untreated and check when the seeds were planted in sand alone. Some of the fungicides which greatly reduced germination of the seed in the sand-soil mixture did not show this effect in sand.

15 Min.

Cultural Variations in the Fungus Glomerella Lagenarium (Pass.) Stevens

GROVER SOWELL and GEORGE E. THOMPSON, Department of Plant Pathology, College of Agriculture, Athens, Georgia.

From an original isolation of the fungus, *Glomerella lagernarium* the cause of watermelon anthracnose, single conidia were isolated and grown in petri dishes on potato dextrose agar at 25° C. The resulting cultures were separated into several different variants which could be distinguished by the rate of growth, abundance of conidal production and color of the mycelium.

15 Min.

A Study of Combining Ability in Once-Inbred Corn

E. BROADUS BROWNE, Department of Plant Pathology and Plant Breeding, University of Georgia.

Data accumulated during the period 1942 to 1945 inclusive were used to determine the relation between the yield performance of 14 once-selfed lines of corn as such, and the yield performance of single-cross hybrids which included those once-selfed lines. Also a comparison was made between the line yields and the top-cross yields of their open-pollinated parent plants. Using the parent-plant top-cross yield data the lines were classified as high-yield or low-yield lines, such that the group of 14 was divided into 7 high-yield and 7 low-yielders. Data from the 1945 yield trials indicated that line performance was essentially as good an indication of average combining ability as was the top-cross performance of the open-pollinated parent plants when all lines were included in the data. When two of the lines which performed so poorly as to be worthless as selfs were ignored, line yields appeared to be superior to the top-cross yields as indicators of average combining ability.

15 Min.

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